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NOTE: This Journal aims to publish original and reprinted reviews of books published in the science-religion area.

The Editor regrets that she is not able to publish, or enter into dialogue on, original articles not tied to a book in the field.

## NOTES ON CONTRIBUTORS

**Christopher Abbess** taught at a number of educational institutions, including City University where he taught Statistics and Computing until his retirement. Since then he has had a range of interests including representing his church at deanery and diocesan synods.

**Robin Attfield** is Professor Emeritus of Cardiff University, where he taught Philosophy from 1968, and has written widely on ethics, environmental philosophy, and theology. His latest books include two textbooks, 'Ethics: An Overview' (Bloomsbury, 2012); 'Environmental Ethics' (second ed. Polity Press, 2014); 'The Ethics of the Global Environment' (second ed. Edinburgh University Press, 2015); and 'Wonder, Value and God' (Routledge, 2017). His 'Environmental Ethics: A Very Short Introduction' is forthcoming from Oxford University Press later in 2018.

**Nathan Aviezer** is Professor of Physics at Bar-Ilan University, specialising in theoretical solid-state physics. He has a particular interest in science and Torah and has published widely, including his books *Fossils and Faith* (2001) and *In the Beginning: Biblical Creation and Science* (1990).

**Paul A. Beetham** is a Methodist Minister and the Superintendent of the Birmingham (West) & Oldbury Methodist circuit. He studied Botany and Zoology at London University and then carried out research in Lichenology at the then University College of Wales, Aberystwyth for which he was awarded a Ph.D. He gained a BA in Systematic Theology at Durham University. He is a member of the Royal Society of Biology and a Chartered Biologist and has published papers in both Science and Theology. He has been a trustee of both The Christ & The Cosmos Initiative and the Science & Religion

Forum. He edited a number of The Christ & The Cosmos publications.

**Finley Lawson** is a LASAR Research Fellow at Canterbury Christ Church University focusing on ways to think about the soul, primary science education and outreach. He is also a part-time PhD student at CCCU. His PhD thesis examines science, religion and identity building on previous work on the nature of theological and scientific descriptions of time/eternity.

**Philip Luscombe** is a Methodist Minister in Ashford, Kent, and Assistant Chair of the South East District of the Methodist Church. Previously he worked training students for ministry in Durham and Cambridge. He is a past President of the Cambridge Theological Foundation. He has taught doctrine, ministerial formation and science and religion. His research interests include the sociology of science.

## EDITORIAL

Members of the Science and Religion Forum will have been saddened to hear of the death of David Bartholomew in the latter part of 2017. David was a former committee member who made a valuable contribution to the Forum. I am very grateful to Christopher Abbess who has kindly contributed a tribute in David's honour.

The format of this edition is slightly different because I am pleased to be able to include an article by Paul Beetham based on a paper given at the last SRF conference, 'Mental Wellbeing, Neuroscience and Religion' held at Bishop Grossetest University, Lincoln. Readers might be interested to know that Mark Harris has written some reflections on the conference at: <https://www.blogs.hss.ed.ac.uk/science-and-religion/2017/09/07/mental-wellbeing-neuroscience-religion/#more-929>. Beetham's article draws some conclusions for the use of the genetic technologies from an examination of the Lunar society of the late eighteenth century. He shows how science cannot be abstracted from its social and political context and argues that this impacts significantly on our considerations of how scientific insights should be put to practical use.

The rest of this edition contains original reviews. The first is an article review contributed by Finley Lawson who discusses Larson and Ruse's *On Faith and Science*. This volume explores the relationship between science and religion, taking in a wide range of topics including ecology, evolution and the brain sciences. As Lawson points out, this is one of several books published recently that approaches the science-religion relationship from the perspective of authors from very different disciplines.

For our other reviews, Philip Luscombe writes about Jonathan Jong and Jamin Halberstadt's *Death, Anxiety and Religious*

*Belief*. This book is a contribution to the psychology of religion, and it investigates whether Feuerbach's claim is true that if there were no death, there would be no religion. I'll avoid a spoiler and let you read the review to find out the answer. Following on from this, Robin Attfield's review of Gernot Wagner and Martin Weitzman's *Climate Shock* draws our attention to the urgency of climate change but also the dangers of relying on geoengineering solutions. Finally, Nathan Aviezer reviews Roger Wagner and Andrew Briggs' *The Penultimate Curiosity*, a book that affirms the harmony of science (the penultimate curiosity) and religion (the ultimate curiosity) both throughout history and in the present day. Like Larson and Ruse's volume, this book focuses on the relationship between science and religion and shows that this subject is still very much of interest to a wide range of scientists as well theologians. Thank you to all the contributors who have made this a stimulating edition.

## TRIBUTE TO DAVID BARTHOLOMEW

David died, quite unexpectedly, on 16 October 2017 while planning a service to be taken the following Sunday as a Local Preacher in St John's Methodist Church, Sudbury, Suffolk. His death was a great surprise to family and friends for although he was 86, he was still very active, walking about the town, across the water meadows and tending the garden.

David knew a lot about probability. Born, in 1931, in the village of Oakley in Bedfordshire he attended the local village school. Against the odds he obtained a place in Bedford Modern School. Against expectation he was allowed to stay on in the sixth form and with staff encouragement he obtained a place at University College London where he excelled in Statistics and stayed to continue with research while completing his BSc and PhD.

Being involved in Methodism while at university provided the opportunity for him to meet his future wife Marian with whom he enjoyed 62 years of marriage. Marian supported him fully with the problems of producing the papers and books that he would be writing. David and Marian have two daughters, Ruth and Ann, both born during the sixties while David was working in Aberystwyth in the newly created Statistics department. Here he was working with Professor Lindley, the sometimes controversial campaigner for Bayesian methods which would have challenged his ideas about statistical inference, even though he remained sceptical about the use of Bayesian methods in many cases. His writings show how well he understood the debate and why his writings can be of value to those who seek to harmonise scientific studies and theological ideas.

While living in Aberystwyth David spent a year at Harvard before starting a statistics department at the University of Kent at Canterbury. He later took on full time work at the London

School of Economics where he remained as a professor until retirement. During his years at the LSE the title Professor Emeritus was conferred on him by the University of London in recognition of his worldwide distinguished academic service. By then he had moved via Boreham in Essex to Sudbury, Suffolk, but his creative work continued up until his death.

David's professional output seems prodigious to me, a late joiner to the statistics community. His website lists 26 books and 134 papers. The books include those with joint authorships and papers exclude 'book reviews and ephemeral publications'! All the entries are colour coded showing that many of his subjects were from social science and topics relating to his expertise in areas such as factor analysis. Where did he find time for his books on chance and belief? He first attracted my attention by his 1988 paper read before the Royal Statistical Society entitled 'Probability, Statistics and Theology'. I wish that I had managed to attend that meeting to hear the comments raised. Later I discovered his book *God of Chance* and after I had joined up with the Science and Religion Forum (SRF) I was ready for *Uncertain Belief* and *God, Chance and Purpose*. Or so I thought until I restarted reading them just recently.

For David's professional achievement I wish to borrow from Ruth's tribute, given at the funeral, about the impact David had on his colleagues.

Concerning his professional standing she writes:

In the world of Statistics he was a teacher, adviser and co-adviser for many PhD students and collaborator on a number of books. Previous students and colleagues have sent messages expressing deepest respect for his intellect, commenting how he wore his great expertise very lightly and was a very humble and a still, calm person. Describing him as a scholar and gentleman, his breadth and depth were admired. He made great



contributions to the theory and practice of statistics, especially for the development of statistics about society. His wise counsel and statistical understanding were greatly appreciated.

His involvement in the Royal Statistical Society having been elected a Fellow in 1955 continued in a number of roles including Honorary Treasurer and President. When he eventually retired from the council he had served about 20 years in total. Words expressed following his passing have commented on his total integrity and wise common sense and the massive contribution in so many ways.

Concerning his contribution to SRF Ruth quotes John Brooke as writing that he was 'deeply impressed by his loyalty and by the academic distinction he brought to our discussions. He is warmly remembered and will continue to be so for all he contributed to the Forum as a committee member and for several years as Editor of our newsletter. He played a crucial role in turning the latter into a much valued regular publication. We all appreciated his critical judgement when advising us against certain new departures that he suspected, correctly, might threaten our standards. In the content of the academic field of science and religion he enjoyed great respect for his work on probability theory and its relevance to theological questions. In that domain I can think of no-one who has been his equal'.

My main objective in writing this tribute is to persuade people to 'Take Time' reading his books again. We have many scientists in SRF but it is unusual to have a statistician who also writes prolifically and cares deeply about getting probabilities and inference right. David is very careful with his critics teasing out the positive ideas and being stern with flaws in handling probabilities. Modern accessibility requirements mean that traces of mathematical formulae have to be hidden

but David manages to enlighten the reader if he or she is willing to follow the script carefully. What is even rarer than finding a statistician writer is finding a review of one of David's books! However in the journal *Science and Christian Belief* (Vol. 21 April 2009, p.95f), Mark McCartney, a maths teacher then at Ulster University, gives a review of *God Chance and Purpose*. Two of his comments, I reckon, would help us to really appreciate this part of David's writing and to join in the concerns that he espoused:

The author does a very good job of explaining the mathematics of probability without recourse to any mathematical formulation. But as a teacher of mathematics I can't help wishing that some of the formulation is put in place (at least perhaps in a few appendices) for the more numerate reader.

The other quote might have made David wince but the admiration is evident:

I found the book hugely stimulating, partly because I found myself in disagreement with some of the author's views, but also because he discusses such a wide range of fascinating topics in what one might almost describe as swashbuckling style!

Do we not all aspire to confidence and directness when talking about issues that concern us greatly?

David will be missed but he has given us tools to use for the future.

Christopher Abbess

## CONFERENCE ARTICLE

### Science, Theology And Politics in the Eighteenth And Twenty-first Centuries.

PAUL A. BEETHAM

*The paper begins with the recent and very significant advances in genetics and the significance of the new restriction enzymes such as CRISPR-CAS9. It then reviews the current theological responses to genetics relating them to Turney's work on genetics and popular culture in which he relates the response to genetics to Mary Shelley's Frankenstein. The paper then explores Mary Shelley's links with eighteenth century scientists such as Joseph Priestley and Erasmus Darwin who were members of the Birmingham centred Lunar Society.*

*The paper continues by exploring the causes of and reactions to the riots of 1791 in Birmingham which were directed against the Lunar Society members. It considers how the scientific issues which produced hostility were related to the various political, social and theological causes of the unrest and the establishment's encouragement of and subsequent leniency showed to the rioters.*

*The attitude of the eighteenth century establishment and public towards the science of Priestley and Erasmus Darwin is compared to current attitudes towards genetic advances such as genetic manipulation and medical applications. It is suggested that as in the eighteenth century these attitudes are not related to scientific issues alone but influenced by political, social and economic concerns.<sup>1</sup>*

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<sup>1</sup> The author would like to thank the Principal and members of St. John's College, Durham where the work for this paper was undertaken when the author held a visiting Fellowship in the Spring Term of 2016. This paper is an extended version of a short paper presentation given at the Science & Religion Conference in September 2017.

**Key Words:** Genetics; Theology; Frankenstein; Priestley Riots; Genetic Engineering.

The Science of Genetics advanced significantly during the 1970s and 1980s through the discovery of restriction enzymes. Gene mapping had previously been carried out by the study of the linkages and association of characteristics which was limited and slow. The use of restriction enzymes found in bacteria and used for defence against virus, enabled DNA chains to be cut at specific places in the sequence of bases and allowed dramatically accelerated progress in gene mapping and genetic manipulation. This allowed gene mapping, first in simple organisms such as the round worm and then of more complex organisms including the human genome. These advances have led to a revolution in the understanding of living organisms and the information that significantly determines their form.

In late 2015 a discovery was made that is already producing an advance in genetics as significant of that of the 1970s and 1980s. That discovery is of new restriction enzymes with more powerful properties than the previously known enzymes. These are known as CRISPR (Clustered Regularly Interspaced Short Palindrome Repeats). The most powerful is CRISPA CAS-9 which allows specific sections of DNA to be renewed or replaced, including complete genes. This new technology opens the way to revolutions in medicine, agriculture, animal and plant biology, microbiology and many other areas. Like all new technologies it holds great promise for use but also for misuse. It has profound implications for our understanding of our own nature and that of creation.

It is possible that biologists have overemphasised the role of genetic material in determining human identity. The human genome is more limited than many other organisms and our environment plays a very significant role in our development and that of our individual characteristics. We have a genome

which produces a much more plastic phenotype than that found in many comparable organisms so that we are not predestined entirely by our genetic makeup. Unfortunately the development of forensic DNA identification methods has produced a pattern that looks remarkably like commercial bar-coding techniques which seems to define us. This barcode pattern is a phenomenon of the characteristics of the DNA which is not the same as sequencing. Because genes interact with the environment genetics is not as determinist as it may first appear. Nonetheless it has important implications for our own understanding of ourselves and our place in creation.

A number of theologians and science theologians have explored these issues including Robert Song, Celia Deane-Drummond and Neil Messer. Whilst their approach varies in detail there is a concern in all of them to define boundaries and set limits to the scope of genetic science. The specific positions of these lines seem to reflect their own biological experience, with Robert Song perhaps being significantly more conservative than Celia Deane-Drummond. They also quite accurately reflect many of the concerns of the secular world, expressing this in theological language. Song's 'ensoulment' addresses the same territory as secular concerns about human rights and identity. The concern of both theologians and the secular world is how far the deepest properties of our being should be subject to the exploitation and control of scientists: such are the themes in Mary Shelley's (nee Wollstonecraft) eighteenth century novel *Frankenstein*. She is concerned in exploring the limits of science and the role of scientists as creators. Is it the case that life should be a property or an attribute which is sacred and the preserve of a Divine Creator or is it the case that it is a property that we can draw from the natural world and make it subject to our understanding and manipulation? If we follow the path of making it an attribute that we control what responsibilities

have we assumed and are we capable of their fulfilment? Turney in his book *In Frankenstein's Footsteps* explores these questions from a secular perspective. He traces the popular responses to genetic advances through the late nineteenth and the twentieth centuries, mapping the ever moving boundaries and lines set by journalists and commentators. Louise Brown's birth was anticipated as the production of a monster in a test tube, but the birth of a beautiful baby to a loving family with which the public could identify, made IVF part of our normality. The choice of Bolton as the place for this work to take place kept it out of the public eye for as long as possible during its development. That which is 'other' becomes normalised.

Erasmus Darwin's name is found in the first sentence of Shelley's preface to the novel *Frankenstein* as he quotes Darwin's work to support the ideal of life emerging from dead material and Mary Shelley cites Darwin in her own introduction of 1831. Darwin's reputation is linked to that of Galvani who used electricity to animate the limbs of frogs and in London Galvani's nephew had carried out 'galvanising' experiments on corpses. We still use the term galvanising to describe the apparent animation of a person who is 'galvanised' into action. It seems likely that Mary Shelley's father William Godwin had known Erasmus Darwin and equally likely that she herself had known him when she was a child.

Erasmus Darwin was a member of the Lunar Society which met in Birmingham during the latter part of the eighteenth century, discussing matters of natural philosophy, philosophy, technology, politics and theology. They met at the full moon not for any lupine reasons, but such an observance regularised the dates and made travelling on eighteenth century west midlands roads much easier and safer. The group had no formal membership. The group included some of the most

eminent minds of the day with Matthew Bolton, Josiah Wedgwood, Joseph Priestley, James Watt and William Withering amongst its members. They met in the house of Matthew Bolton which was next to his factory in the Soho district of Birmingham. Other eminent thinkers of the day such as Tom Paine and Benjamin Franklin were regular correspondents with members of the group. As can be seen from the membership the group included but was not made up exclusively of dissenters from the established church. They were however a significant part of the membership. The group was characterised by innovation and the discussion of radical ideas. It was a place for debate not uniformity. Birmingham had no medieval craft guild structures unlike older more established cities such as nearby Coventry. People were free therefore to come to Birmingham and engage in manufacture and commerce without being part of a guild system. This led to an innovative and radical city where non-conformity and free thinking flourished. It also produced a city of frequent riots and unrest. There was resentment in the town because the majority of leading industrialists were dissenters and at the end of the eighteenth century their wealth and influence dominated the life of Birmingham. Whilst the Lunar Society had no agenda beyond being a forum for discussion and for the exchange of ideas it was regarded with suspicion by those of more conservative views, especially the clergy of the established church.

Prominent amongst the Lunar Society members was Joseph Priestley, Unitarian minister, theologian and natural philosopher. He had been attracted to Birmingham by an attractive stipend, house and a promise that he would be free to pursue his theological and scientific activities during the week, with his preaching duties limited to Sundays. He is best remembered today for his discovery of oxygen, although Lavoisier later coined the term oxygen and there is still hot

debate today concerning who should rightfully be given the credit for its discovery. Priestley also invented carbonated drinks, although a Mr. Schweppes made a fortune from them. His discovery of oxygen stemmed from his experiments in Warrington before his move to Birmingham. There he lived next to a brewery where he made carbonated water by suspending bottles of water above the fermentation vats. Deprived on his move to Birmingham of the brewery his experiments to replicate the effects led to his discovery of different 'airs' which had various properties. He discovered a type of air that would not support a flame and in which a mouse would expire. Placing a green plant in the flask and exposing it to sunlight would 'refresh' the air. The gas given off by mercuric oxide exposed to sunlight through a 'burning lens' was five or six times as good at sustaining a flame and indeed the life a mouse as normal air. He had discovered oxygen although he named it 'dephlogisticated air' in line with the contemporary phlogisten theory. Priestley was well educated, much of his learning self taught in classical and contemporary languages as well as in mathematics and philosophy but as a dissenter he was barred from Oxford and Cambridge. The test acts, dating from the seventeenth century denied degrees, public office and professions to those who were not members of the Church of England in England and Wales. He studied at the dissenting academy at Daventry with great success, was ordained as a dissenting minister and pursued a career as a tutor in Warrington and elsewhere before going to Birmingham as a minister of the Unitarian congregation. A friend of Benjamin Franklin he had already built up a formidable scientific reputation, being elected as a member of the Royal Society in 1766. He was awarded the degree of LL.D (Hon) by Edinburgh University in 1764. Whilst his non-conformity denied him an English university education and position it did not prevent his recognition by



the Royal Society or by an ancient Scottish university. He was however denied the opportunity of accompanying Captain Cook on his second voyage to the Antarctic in 1771, his appointment cancelled by the Board of Longitude which disapproved of his theology, not his science.

The Lunar Society consisted of eminent scientists, innovators, philosophers and theologians with sympathy and connections to radical politics. There were clear connections to the American Revolution through Benjamin Franklin and Thomas Paine. Many were dissenters from the Church of England and they held varied and radical views on a range of topics including politics, theology, the education of women and the structure of society. In 1791 the year of the riots, they organised a boycott of sugar as a stance against the institution of slavery. Their technology changed society and their science challenged established views on the origin and nature of life. It was also in 1791, on 14<sup>th</sup> July, that the members of the Society and others held a dinner at the Royal Hotel, Birmingham to celebrate the second anniversary of the French Revolution. The dinner began with a loyal toast to the King. Support of the French Revolution at that time was considered to be patriotic by many as it was seen as the overthrow of a despot who persecuted his own people and who was also the enemy of the British Crown.

The riots which followed the meeting at the hotel have all the characteristics of being organised and led. The mob was persuaded to leave the hotel and move to other targets. They were directed away from the Quaker Meeting House, being told that the Quakers never made their minds up on anything but instead being persuaded to attack the New Meeting Chapel, Priestley's own church. Having destroyed the chapel they moved on to his house in Handsworth, destroying not only his papers but his scientific apparatus. Priestley's own claim of the involvement of local officials and Anglican clergy

has considerable credence. The mob moved on to destroy numerous other houses belonging to dissenters and the members of the Lunar Society, the houses of Withering and Bolton only saved by the actions of the guards hired for the purpose. The rioting went on until 17<sup>th</sup> July with no serious attempt to halt it by government. Four dissenting chapels were damaged or destroyed and twenty seven houses attacked, many being looted and burned. Magistrates refused to arrest the rioters and released those already in custody. King George III expressed his approval of Joseph Priestley's sufferings. Priestley expressed his grievances in an address to the inhabitants of Birmingham which was widely circulated and various accounts and sermons concerning the riots followed. This was an event of national significance, commentaries being made not just in Birmingham but in places as far afield as London, Essex and Exeter.

It has to be said that Priestley's letter concentrates on his own losses and ignores those which were suffered by other members of the society such as William Russell and James Kier, but they also published separate accounts of the riots. They also complained that whilst Priestley was aggrieved by his own losses he seemed to be oblivious to the equally great sufferings of others.

Many of the publications against the Lunar Society members make the assumption that they were all dissenters from the established church, which was certainly not the case, as demonstrated by Dr Withering an anglican, whose house was only saved because it was defended. An 'Address not yet signed, from the Bishops and Clergy of the Church of England' seeks to deny the involvement of Anglican clergy in leading the riots, however appearance many have favoured the idea of them being involved in the riots. An anonymous handbill published from the Constitutional Tavern in Birmingham on

17<sup>th</sup> October 1791 attacks the churches of the dissenters, the veracity of their accounts and ends in a threatening manner.

‘The lion is too magnanimous to trample upon the fallen – misuse not then his noble nature ye dissenters for if ye again arouse him ....’

Dissenting ministers also had their say. T. Kenrick at George’s meeting house in Exeter comes to the defence of fellow dissenting protestants, but John Clayton at the King’s Weigh House, East Cheap advocates a non political role for dissenters, fearful of the consequences of being seen to go against the established order.

Perhaps the most interesting publication of the time from the scientific perspective is the sermon preached by the Rev Herbert Croft, vicar of Prittlewell in Essex. Rev Sir Herbert Croft as he was ennobled, condemns those who are not content with their situation and who enquire into the cause, whether it rains or whether it is dry. He calls them ungrateful murmurers. For him God was not only the author of the rain and heat, but of all nature at large. The text

‘Say not those, what is the cause that the former days were better than these? For thou dost not enquire wisely concerning this’ (Ecclesiastes Chapter 7, verse 10)

is used by him to complain about those who enquire about weather patterns and anything else.

‘Unwise, ungrateful and wicked murmerers! God is not only the author of the rain and of the heat but of all nature at large’.

Science, technology craft and politics are all condemned together with those meeting in groups, writing books and encouraging questions.

‘How dare we dictate to the God who made us, who placed us here.’

The science of Priestley, Erasmus Darwin, Galvani and others in the eighteenth century challenged accepted concepts of life and its nature. Erasmus Darwin’s ideas on evolution published in *Zoonomia* during his lifetime and in the poem *the Temple of Nature* published after his death predated those of his grandson Charles Darwin. Priestley’s studies showed that life and death depended on the presence of a single constituent of air. The science was not separate from the radical ideas of theology, politics, society and education shared within the group. All were ideas that threatened concepts that people had of their own nature and place in creation and challenged the normalised values of society at that time. The technological and scientific advances produced by members of the group also produced rapid change in society. Those who felt threatened ranged from the King to the vicar of Prittlewell.

‘Science has bestowed upon [man] powers which may be called almost creative, which have enabled him to change and modify the beings surrounding him, and by his experiments to interrogate nature with power, not simply as a scholar passive and seeking only to understand her operations, but rather as a master, active with his own instruments. Who would not be ambitious of becoming acquainted with the most profound secrets of nature; of ascertaining her hidden operations and of exhibiting to man that system of knowledge which relates so intimately to their own physical and moral constitution?’

So writes Sir Humphrey Davy in 1802, quoted by Hindle in his introduction to Mary Shelley’s *Frankenstein* and read by Mary before writing the book. Mary Shelley describes the scientist driving his work forward, disregarding the theological,

sociological and political context in which he works. Like many of the Lunar Society members he is a free thinking outsider, arrogant and fiercely intelligent and like Priestley, alienated from the establishment. Only late in the day does Frankenstein see and take responsibility for his actions, destroying the potential mate for his monster and thus preventing the propagation of future generations of his creatures. By doing this he also ensures his own self destruction. Mobs attack the monster for its appearance and in Ireland, Frankenstein is attacked for being an outsider. Clergy and magistrates are involved in a gross miscarriage of justice as Justine is tried, found guilty and hung for a murder she did not commit. In Birmingham the mob appears to have been organised and guided by clergy and magistrates who also obstruct the justice system.

Dame Ottoline Leyser is a Cambridge Professor of Plant Development. In an interview with Alison Woollard she states that there is no such thing as GM research. There are GM and non-GM routes to applications. She goes on to justify genetic work on crops using logical and scientific arguments whilst protesting that the environmental groups opposing her work do not. The groups that she criticises have often been begun by scientists but later led by those from a non-scientific background. The debate from the scientists viewpoint is conducted in a purely scientific context whilst the opposition comes from a different one. Many of the criticisms made of GM relate to work that was actually carried out by conventional genetics. Most of the complaints are rooted in non-scientific developments such as globalisation, capitalism and politics.

The science is taking place in a broader cultural context than science alone and as in 1791 in Birmingham the disquiet about the science is linked to the context in which it takes place. In parallel to 1791 the legal system shares this

ambivalence. On Thursday 16<sup>th</sup> October 2003 the BBC news reported that the Director of Public Prosecutions said that Judge Roger House had erred in law when he failed to convict anti-GM protestors for disrupting a GM crop trial. The Judge, Roger House had declared that the four had acted in a 'reasonable' way. Their actions of trespass according to the Director of Public Prosecutions were illegal.

The theologians mentioned earlier in this paper seem to provide a coherent challenge to the direction of genetic scientific progress, articulating the broader cultural questions in theological form. Their positions often reflect their own scientific contextualisation with those with the least scientific background being the most cautious. They tend like politicians to try to draw lines in the sand, with the same effectiveness as King Canute. There seems to be little or no dialogue between them and the scientists engaged actively in genetic research. It is often a debate conducted in two separate and mutually incomprehensible languages. The result is inevitable polarisation and isolation.

Alison Woollard in her interview with Dame Ottoline Leyser talks about pure science as something which is unbiased. Such a viewpoint by scientists ignores the cultural, political and sociological contexts in which it is practised. Dame Ottoline claims that those who oppose her work often make statements about the artificial changing of the genetic make up of plants even though human beings have been doing exactly that for thousands of years. The use of the concept of pure science as a way of separating that science from critiques from other viewpoints is neither helpful nor coherent, just as the lack of understanding of the science by its critics is damaging to any serious consideration of the issues concerned.

C. P. Snow in the 1959 Rede lecture in Cambridge described two cultures in western society and that this was a hindrance

in solving the world's problems. His description of the division of separate scientific and humanities cultures is very well illustrated by the current gulf between the science of genetics and the theological and cultural critiques which oppose it. His claim that this is more exaggerated in the British Education systems is certainly consistent with my own experience of Science and of Theology.

Just as in 1791 science, pure or applied has consequences beyond itself which go beyond the competence of scientific education. It is equally true that other disciplines need to embrace science as it progresses. For theology science still poses a threat to cherished concepts and boundaries. Because the biological sciences deal with life and genetics in particular with identity, the challenge to a petrified theology is greater than that presented by most other science. Theology has much to lose as it becomes entrenched behind lines and barriers. Genetics has also much to lose by being desensitised to the wider community's feelings and values. Genetics is practised in the context of a wider society than simply its own community. Headlines about 'three parent babies' concerning mitochondrial therapy illustrate this point very clearly. Professor Robert Song, in conversation with me talks of the precautionary principle, i.e. that we should do no harm. I feel that the Christian command of loving our neighbours requires us to do more than this. We must do positive good and this cannot be undertaken without risk. The danger of the precautionary principle is that we fail to do good for others than we ought to be doing and have the ability to do. For me the key is to act in love, which means to put the interests of our neighbours before those of ourselves. Our modern understanding of genetics and the progress it promises gives us the possibility of enhancing the lives of people in many ways, including in health and a more secure food chain. Genetics like any technology has the potential for misuse, for

diminishing lives and their quality and significance. A positive, responsive and informed Church is much more likely to influence the direction of future developments than one which takes only a defensive, reactive and negative position.

John Wesley, a contemporary of Joseph Priestley and an Anglican who embraced change in society and scientific developments gave the Methodist people this rule of life:

Do all the good you can  
By all the means you can  
In all the ways you can  
In all the places you can  
To all the people you can  
As long as ever you can

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## REVIEW ARTICLE

**Edward J Larson & Michael Ruse, *On Faith and Science*.** Yale University Press, 2017, pp. 312, £25.00 Hbk, ISBN 978-0300216172.

REVIEWED BY FINLEY LAWSON

Larson and Ruse have clearly marketed this book to those new to considering science and religion in a more compatible light. This is evidenced not only by their detailed and insightful suggestions for further reading on the debate but also through their approach in which the thinkers, their theories and their context is clearly set out, managing to negotiate carefully the fine line between assuming knowledge of the key figures and without losing the lay reader. There is enough information for the unacquainted reader to understand the scholars' contribution without leaving the more familiar reader feeling patronised – this is no mean feat particularly with the breadth of scholars and topics covered.

*On Faith and Science* joins an increasing number of books that tackles the relationship between science and religion with co-authors from different academic disciplines, for example, Roger Wagner and Andrew Briggs' *The Penultimate Curiosity: How Science Swims in the Slipstream of Ultimate Questions* (Oxford University Press, 2016) which offers a review of the "debate" framed by scientist and artist. However, it could be argued that *Penultimate Curiosity* is targeted at the reader already well versed in the relationship. Larson and Ruse approach the issue in both a chronological and thematic manner, with the authors alternating as the lead voice from one chapter to the next and with the reader reminded of who is leading each section. They are careful not to focus solely on

Christianity and indeed frequently refer beyond the Abrahamic faiths to Buddhism in particular, but also touch on Hinduism. The focus is not to prove that faith has driven scientific discovery but rather highlight the breadth of interaction, both positive and negative between the two in a way that contextualises the complexities of the debate.

This is very much a book of two halves, and that is not driven by the co-author split but by the subject content. The first, and larger, half of the book deals with the history of the relationship between faith and science more generally. Highlighting key scholars who have worked from or argued for a position of compatibility or hostility to the relationship, it offers a fairly balanced account of the history of the faith and science journey. Clearly articulating some of the context and wider concerns that may have given rise to particular positions the book offers a great introduction to those first seeking to understand the more nuanced relationship. The second part of the book looks at how some of the ethical issues that have arisen from scientific advances have been approached by those of faith in both positive and sometimes surprising ways. For example, whilst in the UK and Europe we are perhaps more familiar with Christianity pointing towards a model of stewardship 'couched in shepherding and caring for flocks' (255), in some parts of the American Evangelical community there are still (the authors provide examples from 2005 and 2013) arguments that God's intelligent design of the universe has built in self-protecting and self-correcting features and therefore we should be 'skeptical of claims that this or that human action threatens permanent and catastrophic damage to the Earth' (254).

The historical survey in the first half of the book begins as one might expect with our first attempts at modelling the universe and the stars and how such models were influenced by our religious understanding that 'up there in the heavens

all is eternal and unchanging and perfect as God intended' (p. 33). The chapter swiftly takes us from Plato and Aristotle via Newton to Einstein, the Big Bang, and Multiverse theory. It explores the move from organic to mechanistic models of the universe and in doing sets the scene for the exploration of the growing place of physics, reason and philosophy. From the believing natural philosophers and scientists of the Enlightenment via Franklin and Shelley, Larson and Ruse explore how the holism of quantum physics has been seen to offer 'a parallel for how God might have an active presence everywhere at once' (73) and the Fysiks Group's 'reviving a perceived linkage between modern physics and Eastern mysticism' (77).

Into this deeply scientific exploration of the relationships between faith and science comes a surprising chapter entitled 'The Brain, the Mind, and the Soul'. The chapter is led by Ruse as the philosopher of the team and offers clear summaries of the Cartesian approach and the shape of the mind under Darwin before exploring the more contemporary computational models of the mind. Larson and Ruse conclude that both the problems with Cartesianism and Leibniz's gap (despite 'the confident claims of Daniel Dennett' (98)) still remain, however our understanding that 'matter is energized – dare one even say "alive" – in a way not dreamed of even in the nineteenth century' (100) may allow for a form of dualism or perhaps 'religious believers can take refuge in the new-mysterianism view that not only has no one yet solved the body-mind problem, but that it is beyond solution' (100). Whilst it may feel like a non-conclusion, it accurately reflects the current state of affairs and the presence of the discussion within an overview of the science and faith relationship is an unusual and welcome addition.

No book regarding the relationship between science and faith would be complete without an exploration of fossils,

Darwin and evolutionary theory and *On Faith and Science* is no exception. Larson and Ruse dedicate three separate chapters to exploring the issues which allows for a more detailed survey of the most common weapons in the science defeats religion arsenal. What I found to be particularly interesting was the dedication of a separate chapter to the question of the evolution of humanity. As the authors highlight 'the big issue has never been the theory of evolution in general but applying it to humans' (159) and the unique challenges it poses to being created in the image of God. It this question of human evolution that draws the truly historical exploration of the relationship to a close. This first section of the book is wide ranging, and whilst some readers may prefer a more detailed treatment of some issues, for those wanting to explore further the bibliographic essay at the end of the book provides some valuable suggestions.

Whilst the authors alternate in leading the "dialogue" during the book there isn't a feel of genuine dialogue or a noticeable change in approach or tone between the lead authors in each chapter – this may perhaps allow for an easier read but, in my mind doesn't provide the sense of dialogue and conversation promised in the introduction. The greatest change in tone rests in the move from exploration of the science-faith dialogue in relation to the scientific journey to the concluding chapters' exploration of the interplay of science and faith in relation to ethical issues.

The choice of Larson and Ruse to explore sex and gender in this volume, and their approach to it, is possibly the weakest aspect of the book. The chapter devotes a lot of time to exploring the social change of women's roles in society (and science) and the progression of some faiths towards an acceptance or tolerance of homosexuality. Whilst this discussion does perhaps play in to the overall conversation between faith and science its presence in the book feels

somewhat contrived and the style of the chapter differs significantly from the others. When one considers its place in the text after a discussion of Darwin and the fact that he 'wrote extensively about gender' (197) in relation to survival and reproduction it is possible to understand the sentiment in including it. However, the multi-faith perspective of the book and the limited space with which the topic is able to be handled means that an incredibly complex issue is reduced to a series of extended bullet points touching on different issues attached to sexuality and gender without providing the same feeling of direction and purpose as other chapters. This is compounded by the troubling assertion that homosexuality may be understood as a genetic by-product 'for instance the genes might be linked to genes for the avoidance of schizophrenia. Or there could be direct selective pressures, such as aiding close relatives' (208-209). This is not helped by the unfortunate closing segway into 'issues of human genetics and eugenics' (211).

Both the genetics and stewardship chapters are more reminiscent of the earlier tone of the book and whilst they feel more informative rather than discursive, they do seem to hold together more coherently. As with the rest of the book the individual chapters contain a lot of information, and this sometimes leads to the chapters feeling overly full or busy. In the bibliographic essay Larson and Ruse comment that the question of ecology at the interface of science and faith is 'a major reason why we wrote this book, to get others engaged and working on this problem' (286). It is a shame that this does not come through more strongly within the book, maybe they have plans for a sequel? The chapters on ethics are an interesting addition to the exploration of the science-faith dialogue. However, whether it was due to their placement at the end of a very full book or the lack of space to explore the issues within an introductory text they were also the most

difficult chapters. This is a shame because it is with these chapters that *On Faith and Science* adds a genuinely unique voice to the science and faith discussion.

Larson and Ruse offer the interested reader a wealth of information, and whilst it may not read as a dialogue *per se* the chapters follow a clear and coherent narrative, and bravely investigate topics that often aren't found within the "standard" science and religion introductory text. Whilst in parts it is clearly geared towards the discussion within the US context, this focus is explicit and in doing so it allows the reader an opportunity to compare the US journey to their own context. As an introductory text touching on not only science and the Christian faith but multiple faiths, it is a success and the bibliographic essay is a valuable resource for those new to the science-faith dialogue or wishing to explore the ethical implications further.

## REVIEWS

**Jonathan Jong and Jamin Halberstadt** *Death, Anxiety and Religious Belief: an Existential Psychology of Religion* (Scientific Studies of Religion: Inquiry and Explanation). London, Bloomsbury Academic, 2016. pp. 232 + xiv. £85 Hbk. ISBN 978-1-4725-7162-5.

REVIEWED BY PHILIP LUSCOMBE

I was interested to review this book as it brought together several of my professional and vocational interests. My own academic work has been in the relation of science and religion, especially looking at some of the broader historical, philosophical and sociological aspects of the relationship. As a Methodist minister and someone who trained others for pastoral ministry I have inevitably encountered the dying and the bereaved in a variety of circumstances, and tried to prepare students for their own future encounters. On an amateur level I have always been interested in popular religious beliefs and the ways in which academics attempt to quantify them.

A quotation from Feuerbach appears towards the start of this book and is repeated at the very end: 'If man did not die, if he lived forever, if there were no such thing as death, there would be no religion' (pp. 34-35 and again, p. 183). The authors set themselves the task of exploring whether this sentiment, often expressed, but rarely examined is in fact true. The book seeks to test some common assumptions used in anthropological and psychological studies of religion: that fear of death is extremely widespread among humans; that this motivates people to believe in supernatural agents; and that these beliefs mitigate death anxiety. The authors see these three hypotheses as of central importance. In the past Freud,



Feuerbach and others simply stated these assumptions as self-evidently true. The authors claim that today 'modern social psychology – and recent methodological advances in the measurement of beliefs, attitudes and emotions therein – provide tools for evaluating the three central thanatocentric hypotheses scientifically.' (45).

Jonathan Jong works on the borders of psychology and cognitive and evolutionary anthropology at the Universities of Coventry and Oxford. He is also an Anglican priest. Jamin Halberstadt is professor of social psychology at the University of Otago, New Zealand. The book began life as Jong's doctoral thesis which was supervised by Halberstadt. Although some of the worthiness of a thesis is apparent, in book form it is enlivened by flashes of sardonic humour. When discussing the possibilities of digital immortality they comment: 'Could we, in social media's version of the Turing test, tell whether our Facebook friends had died? Can we be sure now that they haven't?' (183).

Chapters One to Three explore the definitions of 'death,' 'anxiety' and 'religion,' and how the effects of each on the others might be measured. The reader needs sometimes to pay close attention as to whether 'death' and 'anxiety' are two topics or one, 'death anxiety.' Jong and Halberstadt are aware of the subtleties involved here, and pages 64 to 66 contain a very helpful discussion of the difference between fear and anxiety. Sensibly the authors opt for a limited definition of religion as involving the supernatural, and for their purposes also involving some sort of continuation of the personal beyond death. They are well aware that this is an artificial limitation and these early sections provide an extremely sharp discussion of the difficulty of defining religion that might be useful well beyond the parameters of this study. Death, and especially anxiety about death, proves to be no easier to define. What might people be anxious about? What happens to their

body; or the possibility of their leaving some sort of legacy after death, or the sheer act of dying and the suffering this might entail? In the end the authors opt for anxiety concerning personal extinction as being the closest to what Feuerbach and those thinking like him have in mind (72-73).

The title of Chapter Four asks the central question: 'Are People Afraid of Death?' Jong and Halberstadt analyse the results of a great number of individual surveys and metasurveys. They also show themselves well aware of the shortcomings of many of the surveys, especially the earlier ones. As we have seen above standardised working definitions of religion and anxiety are not available, although the authors show considerable ingenuity in trying to compare results between different surveys. The technical skill exhibited here suggests that we can have confidence in Jong and Halberstadt's initial answer to the question 'are people afraid of death?' 'No, not very much.' (104-105). They note that there is some evidence for the increase of suppressed anxiety in those near to death above that of the general population, but there is not a great deal of evidence here, and what there is shows only a very small effect (111). In general people don't fear death, at least explicitly, so the authors conclude that it is difficult to see how such fears could play a significant role in human culture (113).

There is, however, one complication to be explored, and this is the topic of Chapter Five. Most of the studies attempting to link death and religion have sought to plot a linear relationship between death anxiety and religious belief. They fail to show any significant effect. But, as with any linear study, it is possible that two opposing effects are cancelling each other out. Jong and Halberstadt painstakingly consider this possibility and produce a slightly surprising result: 'Among people relatively committed to a religious worldview, those who are more religious tend to be less death anxious, while at

the nonreligious end of the continuum, the opposite tends to be the case.' 131. What seems to be happening here is that a firmly held world view, *any* firmly held world view, is psychologically helpful in reducing anxiety about death; whilst weaker views are challenged in the face of death, and the confusion this causes tends to increase the subjects' anxiety. But, as the authors themselves remark, these results are open to more than one interpretation. As a further reason to be cautious of generalisations in this area, they briefly explore some studies in different cultures, which tend to show much larger variations due to culture than the comparatively small variations due to different beliefs (131).

What are we to make of these results? Chapter Six 'Death Anxiety and Religion: Causes and Consequences' tightens the screw further. Although the results noted in the paragraph above suggest that increased awareness of death (through laboratory controlled tests and prompts) seem to lead to increased strength of pre-existing beliefs (144) there are some indications that whilst non-believers *explicitly* express stronger disbelief in these circumstances, *implicit* measures suggest a lessening of disbelief (151). So Jong and Halberstadt's own research,

suggests that nonbelievers are torn in the face of death: on the one hand they consciously defend their worldviews, and on the other, they are implicitly tempted towards faith...There is also considerable evidence that religious belief is an effective buffer against death anxiety for those who already believe. (166).

After the complexity of the studies of death, anxiety and religion, the conclusions (Chapter Seven) are more straightforward. Jong and Halberstadt are clear that fear of death is not an important factor in the lives of most people,

and therefore it is unlikely that it provided a causal motivation for the development of religion. Experimentally it is much more difficult to know whether and to what extent beliefs might reduce death anxiety. Good researchers that they are, they see many fruitful areas to explore here.

Standing back from the experimental studies they make a fundamental point in conclusion: We simply cannot claim that the relief of death anxiety is *the function* of religious belief. Complex phenomena, especially psychological ones always need a variety of complex explanations; and the relation of function to holding a belief is obscure – how can we know what religious belief our distant ancestors held, how they came by it, and what evolutionary benefit it might confer? (175).

*Death Anxiety and Religious Belief* is a comparatively short book, but not one to be digested quickly. The relation of death and religion has always been a contested area. Jong and Halberstadt's attempt to quantify the relation is persuasive in its simple answer to the most fundamental question; Feuerbach was simply wrong in his claim that death motivates religious belief. The more subtle issues that they raise, however, await much more research. As with any rigorous interdisciplinary study it is likely that no reader will be completely at home with all the disciplines discussed here, but the challenge of engaging with the book is well worth the effort, even if, finally the book raises more questions than it can answer.

**Gernot Wagner and Martin L. Weitzman, *Climate Shock: The Economic Consequences of a Hotter Planet*, Princeton and Oxford: Princeton University Press, 2015. pp. 264, \$27.95, £22.95 Hbk. ISBN 978-0-691-15947-8.**

REVIEWED BY ROBIN ATTFIELD

This book is a highly clear and accessible account of the problem of climate change, and of what we should do about it. Although it focusses on economic aspects, the text is free of equations (they are relegated to the notes), and only a small part of the text is concerned with economic theories. The style is colloquial, but the message is serious. For example, the authors manage to argue well for pricing (and taxing) carbon emissions at the United States' Government's 2013 level, of forty dollars per tonne (at least). (They were of course writing before the Paris Agreement of December 2015, and before the election of Donald Trump. What they would say about the current administration's attitude to climate change can readily be imagined.)

Wagner and Weitzman warn readers against the fallacy of assuming that even if climate change will be costly, the losses can be compensated by increasing GDP. Thus if the global food supply were to reduce, starving people would not be assisted through the production of more iPhones; nothing but targeting the food problem would help them. (And even that, we might add, risks harming wildlife and their habitats, already at risk from climate change, if more acreage is put under cultivation. Risks and harms for non-human creatures could have been given greater priority.)

Predictably, the authors, as economists, accept the case for discounting future costs and benefits, although they seem either to endorse the low discount rate adopted by Nicholas

Stern in the *Stern Review of the Economics of Climate Change* (1.4 percent) or to hold that the rate should begin in that region and reduce for benefits and losses of several decades ahead of the present, on a basis of 'precautionary prudence'. This at least prevents costs affecting the distant future being treated as insignificant. But the case against across-the-board discounting, and for discounting selectively, and only where there are special justifications, is not presented.

The authors instructively compare climate change with other 'worst case scenarios' such as nuclear war. Other potential catastrophes, such as a collision with an asteroid, are recognised, and held to call for research to work out how to counteract them, but the probabilities of disaster caused by asteroids, biotechnology, nanotechnology or pandemics are represented as much lower than that of unmitigated climate change. They agree that preventing nuclear war and nuclear proliferation are priorities, but so is containing climate change, granted 'the relatively high chance of eventual planetary catastrophe, and the gap between humanity's current efforts and what is needed' (p. 88).

Earlier, in a chapter called 'Fat Tails' they explain that, given a Business-as-Usual scenario, projections of average temperature increases, far from being curtailed at or confined to 4.5 degrees (Celsius), suggest a 10 percent chance of temperature increases actually exceeding 6 degrees (Celsius). Thus there is an uncomfortably high chance of planetary catastrophe, unless concerted action is taken to prevent it. (The Paris Agreement, it could be added, while an important step forward, is far from sufficient, unless the national pledges that it incorporates are ramped up so as to mitigate carbon emissions yet further.)

The authors are rightly concerned about emissions of HFCs (hydrofluorocarbons), with their huge global warming tendency. Maybe they will be taking comfort from the Kigali

agreement of 2016, which spells the phased termination of these emissions, if the signatories adhere to it.

Several arguments are presented against anyone embarking on geoengineering, particularly the kind that would involve releasing sulphate particles into the stratosphere (Solar Radiation Management). For example, any decision at any time to halt such a programme once it had begun could involve a sudden and disastrous leap back to previous levels of carbon dioxide in the atmosphere; and such a programme could potentially change the pattern of monsoons, with equally horrendous consequences. However, ocean fertilisation, or dumping iron into surface waters to promote the growth of algae that would consume carbon (a form of Carbon Dioxide Removal), is nothing like so strongly discouraged, but merely held to be unlikely to be performed on a sufficient scale to make much difference; indeed the authors doubt whether it should even be called 'geoengineering'. This treatment of ocean fertilisation seems blind to the likely environmental impacts of such programmes on ocean ecosystems. Research into such programmes should surely be included in the moratorium that the authors applaud for research into the release of sulphate particles.

This book is nevertheless to be recommended as a thought-provoking and enjoyable read, suitable particularly for non-specialists in economics, and concerning possibly the most urgent global problem of our day.

**Roger Wagner and Andrew Briggs, *The Penultimate Curiosity: How Science Swims in the Slipstream of Ultimate Questions*.** Oxford: Oxford University Press, 2016, pp. 468, £25 Hbk. ISBN 9780198747956.

REVIEWED BY NATHAN AVIEZER

A few decades ago, the science-religion wars seemed to have toned down, if not exactly into an era of peace, at least into an uneasy truce. Stephen Jay Gould had written his widely quoted essay, "Non-Overlapping Magisteria," whose theme is that science and religion have nothing much to do with each other, so why should there be a war between them. His essay is in tune with Galileo's famous aphorism, "The astronomer teaches us how the Heavens go, whereas the Bible teaches us how to go to Heaven."

All this has changed with the rise of the New Atheists, led by Richard Dawkins, Christopher Hitchens and Daniel Dennett, whose books are highly critical of all religion. Indeed, the phrase "highly critical" hardly does justice to the unbridled vehemence with which religion is attacked. Just look at the titles. Richard Dawkins chose *The God Delusion* (published in 2006, over two million copies sold in English alone). Dawkins's title is mild compared to that chosen by Christopher Hitchens, *God is Not Great: How Religion Poisons Everything* (published in 2007, over one million copies sold). The New Atheists are not content to promote their platform merely by writing books. They recently established "Atheist Alliance International," whose mission is "to challenge and confront religious faith and to strengthen global atheism by promoting the growth of atheistic organizations around the world." Membership is growing by leaps and bounds.

The science-religion wars have clearly flared up again, and with a vengeance. So, it is time to gird our loins and march to



the battlefield. Much progress has already been made in defending our faith. In particular, many religious scientists have emphasized the harmony that exists between scientific discoveries and religious themes. One can mention the comprehensive series of books by John Polkinghorne and the wonderful volume by Tom McLeish (*Faith and Wisdom in Science*). And now, another important book, vast in scope, has been added to our library, *The Penultimate Curiosity: How Science Swims in the Slipstream of Ultimate Questions*, authored by the unusual combination of artist and poet Roger Wagner and scientist Andrew Briggs, professor of nanomaterials. Although I would have preferred a different title for the book (the elegance of the title comes at the expense of clarity and I had to read the book to learn that “penultimate curiosity” means science, and “ultimate questions” means religion), I am delighted by its contents.

The theme of the present book is significantly different from that of the book by UK Chief Rabbi Jonathan Sacks, *The Great Partnership: Science, Religion, and the Search for Meaning*. The term “great partnership” implies a friendly relationship between two *separate* entities. The position of the Wagner-Briggs (W&B) book is that science and religion form two aspects of the *same* entity, like two sides of the same coin. In chapter after chapter, W&B trace the history of science, showing why the enterprises of science and religion have been inseparable.

The W&B book follows the dictum of Francis Bacon, who wrote of the Two Books of God: the Book of His Words (Bible) and the Book of His Works (Nature). Faith in God is enhanced by studying His universe. Bacon was preceded in this view by Moses Maimonides, who wrote in the twelfth century that the Torah commandment to love God can best be fulfilled by studying the glories of the physical world and seeing in them

“God’s infinite wisdom, which immediately leads one to love God and to be in awe of Him.”

The proliferation of knowledge in the last few decades has revolutionized many branches of science. The simple clockwork universe of Newton, Galileo, and Laplace has been replaced by a universe so complex and so wonderful that it almost defies comprehension. This discovery has recently been called “the Wow Principle,” the felicitous expression introduced by Alister McGrath.

The W&B book emphasizes that maintaining belief in God does not require the abandonment of rational thinking. Quite the contrary. Modern science has become a valuable tool for deepening one’s faith. It is important to emphasize this point because the New Atheists take the completely opposite point of view, claiming that modern science has demonstrated that God does not exist. In the pithy words of Dawkins, “Darwin kicked God out of biology, and Stephen Hawking has now administered the *coup de grace*.” Their basic assumption is that if science can explain some phenomenon, this demonstrates that God is not involved in that phenomenon. Therefore, since science appears to be able to explain just about everything, Dawkins-Hitchens-Dennett conclude that God is not involved in anything or, equivalently, God does not exist.

The W&B book is an elegant antidote to this bizarre view. For example, W&B state that Isaac Newton had the exact opposite point of view: “Newton drew the inference that a universal being would create universal laws” (xix). In fifty fascinating chapters, W&B examine the effect of new scientific discoveries throughout the ages on belief in God. In the Prologue (xvi), W&B point out that the doors of the world-famous Cavendish Physics Laboratory of the University of Cambridge carried the following inscription from Psalms 111:2: “The works of the Lord are great; sought out by all who have pleasure in them.” Similarly, the Oxford University

Science Museum has carved over its entrance doors an angel with a book in one hand and germ cells in the other hand, to signify “bringing together future generations to study the open book of nature and the mysteries of life under the guidance of a higher power” (xvii). These leading universities thus declare that studying nature deepens one’s understanding of the close connection between science and faith.

W&B develop this theme throughout their book, “relating the connections between the ‘ultimate’ curiosity (religion) and the ‘penultimate’ curiosity (science)” (53). Chapters 8-10, collectively called “God-Driven Science,” discuss the Greek view of the relationship between nature and the divine. In Chapter 7, we are introduced to the “cognitive science of religion” (CSR), in which W&B call attention to the fact that the “revolutions in thinking that ultimately gave birth to science seem to have taken place in tandem with a religious paradigm shift” (61). In the later chapters, W&B draw from the writings of great scientists, including Maxwell, Faraday, Galileo and Kepler, all of whom emphasized the unity found in nature and related this unity to their faith. Chapter 48, entitled “The Unity of Nature,” describes the great discovery of James Clerk Maxwell that electricity, magnetism and light are all different aspects of the same phenomenon of nature, now called “electromagnetism.” The important British scientist Michael Faraday had anticipated such a discovery, and he found it natural to relate the unity of nature to belief in God: “I cannot doubt that a glorious discovery in natural knowledge, *and of the power and wisdom of God in creation, is awaiting our age*” (396).

W&B emphasize that for Victorian scientists, “openness to new data was expressive of religious commitment, rather than destructive of it” (xviii). Maxwell is quoted as stating that “we should think what a great thing we are saying when we

pronounce the laws of creation, and say that they are true. Is it not wonderful that man's reason should be made a judge over God's works" (397). These are the words of the leading physicist of the nineteenth century!

The understanding that there exist laws of nature, taken for granted today, was revolutionary in earlier centuries. The profound changes in thought brought about by this new understanding are described throughout this book. W&B tell us that Galileo and Kepler wrote that our ability to understand science "proved that the human mind is the work of God" (397). And again, "in Galileo's dialogues, the idea of a universal law (of nature) established by a God who stood outside of nature first began to appear" (xxi).

Views similar to those quoted by W&B have been made by other scientists as well. Albert Einstein, the leading physicist of the twentieth century, wrote: "The most incomprehensible feature of the universe is that it is comprehensible." Nobel laureate Eugene Wigner has written a famous essay entitled, "The Unreasonable Effectiveness of Mathematics in the Natural Sciences." Why is it, ask these famous scientists, that we are able to understand our exceedingly complex universe, when such understanding is unrelated to our daily lives? John Polkinghorne wants to know how the ability of the human brain to formulate quantum field theory and general relativity has added to our chances for survival. Human beings certainly seem to be more – much more – than just the product of random mutations that increased our ability to produce fertile offspring.

And let us not forget the Anthropic Principle, according to which the laws of nature appear to have been designed to permit life to exist? The many instances are too numerous to list here; two brief examples will have to suffice.

(i) If the nucleus of the carbon atom did not have an energy level at *exactly* a specific value, the universe would not contain

carbon or oxygen or nitrogen or any of the other chemical elements that are necessary for life.

(ii) Life on Earth depends of the energy of the Sun. However, if the strength of the nuclear force did not have *exactly* the value that it has, then the Sun could not bathe the Earth with its energy. If the nuclear force were a tiny bit weaker, then the Sun could not shine at all and the Earth would be a dead rock floating about in space; if the nuclear force were a tiny bit stronger, then the Sun would have exploded long ago and the Earth would have ceased to exist and life would never have developed. And finally, these statements apply to all other stars as well.

Particularly perceptive are the impressions of Freeman Dyson, a world-famous, secular scientist, whose words capture the very essence of the Anthropic Principle: "As we look out into the universe and identify the many features of physics and astronomy that have worked together for our benefit, it almost seems as if the universe must have known that we were coming."

The historical descriptions in this book are both very relevant and very interesting. W&B trace the development of science starting from the pre-modern world, always describing its close association with religion. The Greek world of Aristotle, the importance of the great city of Alexandria, and Arab scholarship in the medieval period, all these provide the background for the great renaissance in learning that left no aspect of knowledge or science untouched. W&B describe the questions of faith that were raised by these many new scientific discoveries and why these questions occupied such a central role in man's thinking.

In the Epilogue, Wagner and Briggs summarize their conclusions and write down (411) the following ideas that are based on their conclusions:

1. The idea of a single, beneficent, rational agency whose rationality could be expressed in mathematics and read in the humblest aspect of Creation.

2. The idea that this agency could not be identified with anything within the universe, but gave to the whole a law-like character.

3. The idea that truth is not the exclusive property of any single civilization.

4. The idea that truth cannot be imposed by force but involves the right, even the duty, of individual investigation and experiment.

Finally, a word should be said about the aesthetic qualities of this book. On many of its pages, one finds fascinating pictures, judiciously chosen to illustrate the text. No one who reads this book will ever again think that science is dull or dry.

A delightful read!